



Journal of Environmental Science & Engineering

(<http://www.neeri.res.in>)

ISSN 0367-827 X

Volume 59

No. 3

July 2017

CONTENTS

Environmental System Design Modelling & Optimisation

- * **Rooftop Rainwater Harvesting Potential within the purview of Institute of Science for Groundwater Sustenance** ... 363-368
Ms. Geetai Laxane, Dr. Anagha Patil, Dr. Sushama Narkhede
- * **Porous Concrete as an Environment Friendly Construction Method for Parking Area** ... 369-372
Chad Rahul K, Chauhan Brijesh M. Baldaniya Manish R.
- * **Reductions in Fuel Consumption by Implementation of Solar Energy on Watercraft** ... 373-376
Praveen Kumar Sargada, Ritesh Katara, Mr. Laxman Suman

Environmental Monitoring

- * **Assessment of Groundwater Quality in Patna Urban Area: A Statistical Approach** ... 377-382
Vijaya Laxmi Upadhyay, Saurabh Sakhre

Environmental Biotechnology

- * **Mushroom : A Novel Tool for Mycorestoration and Mycoremediation** ... 383-390
Tripti Gupta and Rahul Mourya

Environmental Impact & Risk Assessment

- * **Study on the Impact of Pesticides on Environment : An insight of Farmers Perception and Consumer's Perspective** ... 391-400
Manish Mohan Gore, K. B. Bhushan and Avilekh Naryal

Rooftop Rainwater Harvesting Potential within the purview of Institute of Science for Groundwater Sustenance

MS. GEETAILAXANE¹, DR. ANAGHA PATIL², DR. SUSHAMA NARKHEDE³

Water Scarcity encompasses water stress, water deficit, water crisis and water shortage. Imbalance between availability and demand, the degradation of groundwater and surface water quality, inter-sectoral competition, interregional and international conflicts, all contribute to water scarcity. The conventional water sources namely well, river and reservoirs, etc are inadequate to fulfil water demand due to unbalanced rainfall. A customary elucidation to dazed water scarcity is Rain Water Harvesting method (RWH). The aim of the present study is to use rainwater and thus taking close concept to the water conservation. In this paper, the Rooftop Rain Water Harvesting (RRWH) technique is analysed as a substitute source of water for flushing and other purpose within the purview of Institute of Science College, Nagpur.

The objective of the study was to compute the rainwater harvesting potential yearly as well as for five years. This helped to further analyze the water deficit between Rooftop Rain Water Harvesting (RRWH) potential and the water required by academic institution for domestic as well as flushing purposes in two categories namely with-boarding and without boarding. Rooftop Rainwater Harvesting Method (RRHM) was selected to quantify the amount of water that could be harvested and utilised after collection, two parameters are used viz. average rainfall intensity and catchment area. The yearly rainwater harvesting potential was found to be 30,67,017.7 litres in year 2013, 17,63,956.4 litres in year 2014, 22,71,925.6 litres in year 2015, 18,63,255.4 litres in 2016, and 20,85,974.8 litres in 2017 with the 9367.8 m² of total roof area. The rainwater harvesting potential for five years was found to be 22,10,238.7 litres. The year wise rainwater harvesting potential revealed that in the year 2013 there was higher rainfall as compared to subsequent years thus had the high rainwater harvesting potential. Result obtained from the present study suggested that, Rooftop rainwater harvesting method in academic institution is a substitute for drinking and domestic water sustainability to the institution especially during dry seasons eventually balancing the ground water table.

Key words : *Rooftop Rainwater Harvesting Potential (RRWHP), Catchment area, Average Rainfall Intensity.*

1. Introduction

Water is a dynamic entity essential for the survival of life on mother Earth, being a natural resource of principal importance to all the life-forms. About 70% of the earth's surface is covered by water therefore the earth is known as water planet (<https://shodhganga.inflibnet.ac.in/>). In arrears to the cumulative industrialization and exploding population, the demands of per capita water supply have increased tremendously thereby creating stress on available ground water resources. Imbalance between availability and demand, the degradation of groundwater and surface water quality, inter sectoral competition, interregional and international conflicts, all contribute to water scarcity (Ringler, C., Biswas, A., and Cline, S., 2010). The thirst of water for India's rapid development is growing day by day ("Overcoming Water Scarcity". Vidya Kulkarni UNICEF).

Currently the prime source to all the water supply schemes is "Rainfall" whereas scarcity of water can be jettisoned by harvesting the rainwater sustainably. Rain water harvesting is a process involving collection and storage of rain water with the help of artificial design system. (Centre of Excellence for Integrated Land use Planning and Water Resource Management ILPWRM). Roof top rain water harvesting is the technique through which rain water is captured from roof catchments and stored in tanks or reservoirs. (S. S. Dara). Roof top rain water harvesting is to make water available for future use and recharge the ground water table to maintain the water resource. This technique is particularly important in dry-land with low ground-water table, hilly, urban as well as in coastal area.

India receives average annual precipitation of 4000 km³, out of which 700 km³ is immediately lost to the atmosphere,

¹ Department of Environmental Science, Institute of Science, Nagpur, India.

* **Corresponding Author :** Ms. Geetai Laxane, Email id: geetailaxane28.gl@gmail.com

Porous Concrete as an Environment Friendly Construction Method for Parking Area

CHAD RAHUL K, CHAUHAN BRIJESH M. BALDANIYA MANISH R.

Most cities today are covered with impermeable roads. In areawith a poor drainage system, this leads to severe in flooding in low areas. In this situation, it is convenient to provide porous concrete. However, there are very limited standards for measuring this property. Pervious concrete should have high voids compared to conventional concrete, which is achieved by small or no amount of fine aggregates. It has low compressive strength compared to conventional concrete, but it has high permeability. Permeability ranging from 0.5mm/s to 4mm/s. It is suitable for low volume roads, parking lots and pedestrian walkway.

Keywords :

1. INTRODUCTION

Pervious concrete is a porous concrete paving material which permits rain & storm water runoff to percolate through it rather than flood surrounding areas or storm drains. It is usually a mixture of 10mm to 12mm average diameter aggregates, hydraulic cement, little proportion of sand, admixtures & water. When properly placed, pervious pavement will contain voids that would permits the storm water through it. Like a honeycomb, these voids are held together with cement.

Pervious concrete pavement is a unique & effective means to address important environmental issues & support green, sustainable growth. By capturing storm water & allowing it to seep it into the ground, porous concrete is instrumental in recharging groundwater, reducing storm water runoff. In fact, the use of pervious concrete is among the best management practices & recommended by geotechnical engineers across the country – for the management of storm water runoff on a regional & local basis. This pavement technology creates more efficient land use by eliminating the need for retention ponds & other storm water devices.

1.1 IDELAZITION OF PROBLEM

1.1.1. Water logging- Due to heavy rainfall, roads are blocked leading to traffic jams, pedestrians have to Suffer through flooded streets & especially the urban poor, livings in slums.

1.1.2. Surface runoff- Due to impervious roads & foot path, 80% of pure storm water will flows to the sea or lake which is very important for our country in many ways like ground water recharge, for irrigation, to reduce scarcity of water.

1.1.3. Water Scarcity- Due to more & more use of ground water without recharging it will results in a great fall of ground water table & many towns and cities are suffers from scarcity problems in India.

2. EXPERIMENTAL WORK

2.1 Various tests are performed to find the basic Engineering properties of aggregate.

The results of various tests performed are shown in **table-1** to **table-4**.

Table 1 : Result of Specific gravity test performed on coarse aggregate.

Sr. No.	Description	Observed value for 10mm size	Observed value for 12.5 mm size	Observed value for 20 mm size
1	Weight of saturated aggregate and basket in water: W1 (g)	491.3	491.8	492.2
2	Weight of basket in water: W2 (g)	645	645.2	645.2
3	Weight of saturated aggregates in air: W3 (g)	932.9	933	933
4	Weight of oven dry aggregates in air:W4 (g)	2.31	2.32	2.32
5	Apparent Specific Gravity:W4 / [W4 – (W1 – W2)]	2.41	2.41	2.45
6	Bulk Specific Gravity:W4 / [W3 – (W1 – W2)]	2.35	2.35	2.35

Dept. of Civil Engineering, Birla Vishvakarma Mahavidyalaya College, Vallabh-vidyanagar, India

Dr. Darshana R. Bhatt, Dept. of Structural Engineering, Associate professor, Birla Vishavakarma Mahavidyalaya College, Vallabh-Vidyanagar, India.

Reductions in Fuel Consumption by Implementation of Solar Energy on Watercraft

PRAVEEN KUMAR SARGADA¹, RITESH KATARA¹, MR. LAXMAN SUMAN²

In the modern period, along with the means of transportation, energy consumption is also increasing. During this time, the consumption of non-conventional energy can be reduced by using solar energy and wind energy, such as a ship, aircraft and road traffic etc. Of which, using solar energy and wind power for the ship can prove its successful utility. Thus we are going to discuss in this paper how to apply the utility of solar energy and wind power to ships. Like this we can easily save the environment by to implement solar and wind energy system aboard ship.

Key Word : *Solar energy, Photovoltaic cell, Ship Emission, Sailboat, Watercraft, Ferry, Wind mill*

1. Introduction

A Solar and Wind energy power are a part of natural energy. Solar Energy Policy infrastructure in renewable energy sector in India. Solar and wind energy power typically used in water craft . so these gauges to spot possible problem. This depend on PV cells directly convert sunlight into electricity.

In global climate change regime, India has been regarded as a prominent player due to its huge population, developmental needs and great economic potential. Since the Earth Summit 1992, India has been playing a very important and pivotal role in shaping global environmental policies. In 1972, at Stockholm conference, Indian Prime Minister Smt. Gandhi described "poverty as a greatest polluter" and thus underscored India's preference to the development to eradicate poverty. Thus, India's policy stand in international climate change regime has been articulated around the equal right of development for each individual. India had successfully negotiated during the making of United Nation Framework for Climate Change (UNFCCC) and "Common but Differentiated Responsibility" article 7 of the Rio Declaration can be marked as grand success for India and hence for all developing nations. The principal of CBDR explicitly acknowledged the historical responsibility of developed countries in the degradation of the environment and hence, assigned the primary responsibility to the developed countries to avert climate change and its adverse effects.

2. Applications Of Solar And Wind Power System In Marine

1. Marine renewable energy will play an important role in assisting shipyards meet energy efficiency design index (EEDI) requirements.

2. It will use ship owners comply with pollution reduction regulation.
3. Solar panels are used to battery bank.
4. It is used to run electric devices such as navigation radio, navigation light, emergency lights and alarms etc.
5. It is assist to data collection to used analize for marine.

3. Methodology

3.1. Materials

- a. Photovoltaic,
- b. Ship,
- c. Sunlight radiation rout,
- d. System deck aboard ship.

3.2. Implementation

The Ministry of Unconventional Energy Sources is running programs for technology development, certification, economic and financial incentives, publicity etc. to encourage the use of this energy. As a result, the technology has now attained almost maturity and its efficiency and economic costs have also improved significantly. It has been proved by field trials on a large scale that it is an appropriate technology as like (fig 1). for ship, residential buildings, restaurants, hotels, hospitals and various industries (food refining, medicine, textiles, box detainees, etc.).

When we heat water with solar heat, it saves electricity in times of high need. One megawatt of electricity is saved from 1000 domestic solar water heaters of 100 liters

¹ Student, Department of Civil Engineering, G.E.C.Banswara,

² Assit. Professor, G.E.C. Banswara

praveensargada92@gmail.com, rtsskatara750@gmail.com, laxman.high@rediffmail.com

Assessment of Groundwater Quality in Patna Urban Area: A Statistical Approach

VIJAYALAXMI UPADHAYAY^{1*} SAURABH SAKHRE¹

The present study deals with the water quality assessment of Patna urban area as there were problems in water quality was reported in previous studies. A total 50 number of samples were collected from three zones of Patna Municipal Corporation. Water quality characterization was done in Patna state laboratory and *pH*, *TDS*, *EC*, *Turbidity*, *TH*, *TA*, *Cl*, *Ca*, *Mg*, *SO₄*, *NO₃*, *Fe*, *FAs*. Descriptive and inferential statistics was then performed on the water quality dataset. Results showed that water quality of some areas in Patna Municipal Corporation is beyond their permissible limits and *Digha chauhata*, *Magadh mahila hostel* and some areas near bypass road are some of them. It is observed that Fluoride is within the desirable limit and a small percentage (2 % of the samples) of Arsenic exceeded the desirable limit. 16 % of the samples found above desirable and permissible limit in case of Iron. The study suggests immediate mitigation measures for the degraded water quality of some locations in Patna urban area.

Keywords:

Introduction

Ground water occurs beneath the surface of the earth. It is a very precious water resource which plays an important role for human and all the other living beings on the earth. It is reported that for drinking water supply, approximately one-third of the world's population depends on springs, dug wells and bore wells (Patil et al 2015).

Groundwater plays a very significant role in agriculture, drinking and industrial purposes. Groundwater quality depends on several factors and few of them are atmospheric precipitation, inland surface water, quality of recharged water and sub-surface geochemical processes. Change in ground water quality not only affects human health but also threat for social prosperity and economic development (Milovanovic; 2007). Quality and quantity of ground water varies from place to place because it depends on the depth of water table and type of aquifers.

World Health Organization (WHO) and Bureau of Indian standards (BIS) prescribes limit of various water quality parameters for drinking purposes. As these is an era of rapid urbanization and industrial growth, there has been reported improper waste disposal and over exploitation, quality and quantity of groundwater decrease especially in urban areas (Ramakrishnaiah, et al 2009). As a result of these, different kind of salts got percolate in groundwater and deteriorates the quality of the groundwater (Sonawane and Khole, 2010).

In the last few decades, due to excessive growth of population and industrialization there has been a vast rise in the demand for fresh water. There is major problem in case of ground water as once quality of groundwater is deteriorated;

it is hard to restore its quality. Thus, management and regular assessment of ground water quality is necessary (Bajpayee et al, 2012).

Present studies on Patna urban area lacks sufficient data and analysis to reach to a concluding water quality status. Also, the literature available on groundwater quality of the study area has been carried out using less number of sampling points. Therefore, the aim of the present study is to collect and characterize a representative number of groundwater samples from Patna urban area. The study will be helpful for decision makers and governing bodies to plan and maintain protocols for efficient groundwater quality management.

2. Study Area

Patna is the capital of the province of Bihar situated on the southern bank of the river Ganges in Eastern India. The city is part of the alluvial flood plain of the river Ganga and is surrounded by three rivers viz. Ganga, Punpun and Sone. The Sone River flows in the west and Punpun River flows in the south. The municipal boundary of the Patna stretches between 25°33'22" and 25°39'2" N to 85°31'12" and 85°15'5" E. The total geographical area of Patna Municipal Corporation (PMC) is 109 km² (Ashraf, 2014). The average elevation of PMC with reference to mean sea level is 519 m. The base map and sampling locations in the study area is shown in **Figure 1**.

The PMC is constituted in 72 numbers of wards with an average population density of 16000 persons per square kilometer (Saha et al 2014). Patna is the most populous city of the state of Bihar. As per the census of 2011, population of Patna is 1.6 million of which 790823 and 893399 are male and female respectively (Census 2011).

¹ Centre for strategic Urban management (C-SUM), CSIR-National Environmental Engineering Research Institute, Nagpur.

* Corresponding author :

Mushroom : A Novel Tool for Mycorestoration and Mycoremediation

TRIPTI GUPTA AND RAHUL MOURYA

Mushroom cultivation is a direct utilization of their ecological role in the bioconversion of solid wastes generated from industry and agriculture into edible biomass, which could also be regarded as a functional food or as a source of drugs and pharmaceuticals. They release of extra-cellular lignocellulosic modifying enzymes, with a low substrate-specificity, so they can act upon various molecules that are broadly similar to lignin and cellulose. 'Spent Mushroom Substrate' (SMS) is leftover of biomass generated by commercial mushroom industries after harvesting period of mushroom the major applications of SMS are animal feedstock, fertilizer, energy production and wastewater treatment. SMS would have been biochemically modified by the mushroom enzymes into a simpler and more readily digestible form, which could then be used in 'mycorestoration' and 'mycoremediation'. Mycoremediation relies on the efficient enzymes, produced by mushroom, for the degradation of various types of substrate and pollutants. Besides waste degradation, mushroom produced a highly nutritive and medicinal valuable product for consumption. Mushroom consist of high amount of protein, carbohydrates, vitamins, fibers and minerals beside these mushroom posses lectins, lovastatin, eritadenine, lentinan, hericenone, cordycepin, Beta-glucan and erinancines, which help in enhance the secretion of insulin, lowers cholesterol synthesis, anti-cancer agents, antioxidant, help in improve neurological health, liver protection and improve immunity. This article also reviews the achievement and current status of mycoremediation technology based on mushroom cultivation for the remediation of waste and also emphasizes on the importance of mushroom as product. These methods represent the potential to create a clean ecosystem.

Keywords : *Mushroom cultivation, Spent Mushroom Substrate, Mycorestoration, Mycoremediation and Immunity.*

INTRODUCTION

Mushroom can be considered a functional food (medicinal & nutritional). A number of scientific studies that's strongly support some functional foods such as Mushroom as having a role in disease prevention in some cases of bring about a suppression or remission of a diseased rate and also use for therapeutic purposes. It is also a significant tool for restoration, replenishment and remediation of Earth's over burdened ecosphere. They play valuable roles in ecosystems. As the decomposers, they are responsible for recycling dead organic matter back into molecular form to be used over and over again by other organisms as nutrients.

The bioconversion of lignocellulosic biomass by the mushroom industry to food and useful product is also a significant contribution to the management of agricultural and industrial wastes at regional and national levels [4]. They produce enzymes that degrade lignin allowing them access to the cellulose in wood. Cellulose is the carbon source for the mushroom [25]. As they breaks down wood and leaves, a rich material called humus is formed. In the natural ecosystem, a realm of organisms from different kingdoms make their assault on those different substrates that are present, and the rate of

degradation becomes maximal when there is a good supply of nutrients in the soil, e.g. N, P, K and other essential inorganic elements [28]. They are highly efficient in decomposing starches, hemicelluloses, celluloses, pectins and other sugar polymers, and some can degrade such intractable substrates as fats, oils and chitin.

The Mushroom cultivation method for edible mushroom varies considerably around the world. Method primarily depends on the type of mushroom. Mushroom cultivation is a potential biotechnology process where in the waste plant material or negative value crop residences may be converted into valuable food. They can be developed from biological wastes, agricultural wastes, agro-industrial wastes and industrial wastes mostly remain unused. This material has to be disposed off by burning or some wasteful method with course environment pollution. By suitable treatment there residues can be converted into substrates for cultivation of mushrooms and spent substrate (spent compost) can be utilized as manure. Mushrooms are rich in vitamins, mineral and proteins etc

The Applied mushroom biology can provide the solution of various environmental problems in the following ways:

Study on the Impact of Pesticides on Environment: An insight of Farmers Perception and Consumer's Perspective

MANISH MOHAN GORE^{1*}, K. B. BHUSHAN², AND AVILEKH NARYAL²

Pesticides produce a huge impact on the environment. Farmers, farm workers, vendors, and end-users possess a variety of perceptions about the effects of different pesticides. The present study provides an analysis of the perception of farmers and consumers on the environmental impact of pesticide handling and use. This study also explores effective communication measures about the harmful effects of pesticides to make people aware. In this study, it was found that most of the farmers use a chemical pesticide, and farmers had a greater influence on pesticide vendors' advice about pesticide use. Farmers had limited knowledge about the proper guidelines of pest management and recommendations. Most of them had an opinion that chemical pesticides are harmful to the environment. Focused group discussion with scientists & science communicators revealed that there was lack of knowledge among farmers as well as end-users about the use of alternatives such as organic farming, Integrated Pest Management (IPM), bio-pesticides, herbal pesticides, and natural predators. Considering the environmental implications, there is a dire need for logical thinking to enable both the farmers and consumers to choose the better alternative/s rationally.

Key words: *Pesticide, environment, alternatives, science communication.*

1. Introduction

Chemical pesticide kills plant pests as well as poses risk to the environment and human health (Shetty, 2010). This happens because when the pesticide is applied in the farm, it's a very meager portion reach out to the target pests and major portion spread in the environment. Chemicals of the pesticide are retained in plant tissues and can act as a source of human food pollution (Edwards, 2013; Gregoire, 2009; Bundschuh *et al.*, 2019). It is obvious that indiscriminate and excessive use of pesticides pollutes not only the environment but also the food chain, thereby affecting the health of farmers, the public, or the end-users (Singh *et al.*, 2018; Tonelli & Tonelli, 2020; Meftaul *et al.*, 2020). This study focuses on the peoples' (both the farmers & public) perception on pesticide use, its impact on environment & health and suggesting the role of science communication approach for creating awareness to adopt an eco-friendly alternative to the chemical pesticide in two districts of western Uttar Pradesh (India) namely Ghaziabad and Hapur. The study also explores the possibility of creating awareness and public understanding of the use of alternatives other than chemical pesticides through science communication interventions.

2. Material and method

Considering the importance of various pesticide issues, the present study intends to examine the environmental

and human health issues of pesticide usage in two districts, namely Ghaziabad and Hapur of western Uttar Pradesh. The broader objectives of the study are to assess the extent of use of chemical and alternative methods of crop protection being used by the farmers in two of the said districts of western Uttar Pradesh and to evaluate the extent of the awareness and perception about the harmful effects of chemical pesticides on environment and health. In the study, various types of primary, as well as secondary data, have been utilized. The former being the survey, interviews, and semi-structured questionnaires on various issues of pesticide use and its effect on health and environment were collected extensively from the 100 selected sample farmers.

3. Result and discussion

It is an open fact that the ever-increasing requirement of having higher crop production has led to increased use of pesticides by the farmers (Rasul & Thapa, 2004). Here the root cause of enhanced crop production was induced because of the growing population of the country. Several studies have been conducted to find out the impact of chemical pesticides on environment and health (Subash *et al.*, 2017; Raza *et al.*, 2019; Kaur *et al.*, 2019; Sankoh *et al.*, 2016). It is felt that most of the farmers and consumers or the general public are ignorant of the harmful consequences of the use of chemical pesticides (Negatu *et al.*, 2016; Jallow

¹ CSIR-National Institute of Science Communication and Information Resources, New Delhi, India

² Vigyan Prasara, A- 50, Sector 62, Noida, Uttar Pradesh, India